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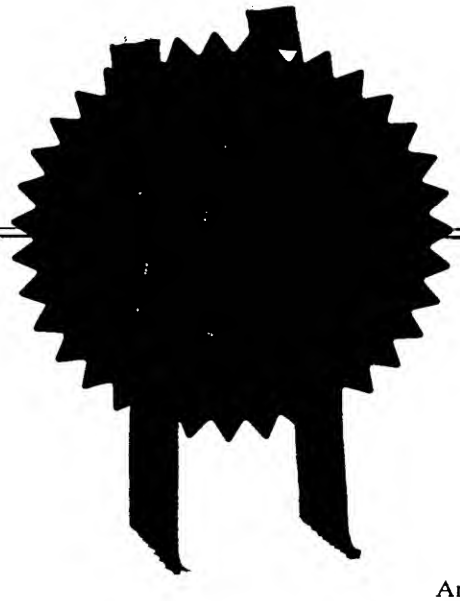

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Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

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1. Your reference DC.RP.STH007/P44927

2. Patent application number *(The Patent Office will fill in this part)* **0008310.5** 06 APR 2000

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

STATUS HI-TECH LIMITED
VENTURE HOUSE
1-2 THE AVENUE
HOLBROOKS
COVENTRY
CV6 4AF

Patents ADP number *(if you know it)* 7 4166 54003

If the applicant is a corporate body, give the country/state of its incorporation: UNITED KINGDOM

4. Title of the invention: A SWITCH

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

WITHERS & ROGERS
Goldings House
2 Hays Lane
London
SE1 2HW

Patents ADP number *(if you know it)* 1776001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*
/	/	/

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*
/	/

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(answer 'Yes' if:*
a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

YES

A SWITCH

The invention relates to a switch and particularly to, although not exclusively limited to, a switch which requires no physical contact with a circuit.

Switches for electrical circuits normally comprise a physical break in the circuit which allows an operator to complete the circuit by actuating an appropriate lever. Conventional electric light switches are an example of such an arrangement where an insulated lever is connected to a break in the circuit and actuation of the lever completes the circuit to allow the light to be activated. Such switches have several drawbacks. Firstly, because the switch is a mechanical interface with the circuit the switch is subject to wear and may eventually fail. More importantly, conventional light switches cannot be used in environments where there is a likelihood that conductive material could cause either shorting of the circuit or an electric shock hazard. An example of such an environment would be a bathroom where there is a likelihood that the user may have wet hands when activating the switch. That presents significant risks of electric shock to the user. Consequently, such switches are not used in bathrooms and the switch is either arranged outside the bathroom or alternatively the switch is located in the ceiling and is actuated by means of a pull string.

In that way a non-mechanical switch is provided which enables a circuit to be switched without physical contact by the user since the switch activation presence can be the physical proximity of, for example the user's hand, to the switch oscillator. There is no requirement for physical contact with the device since physical proximity of the user's hand with the switch oscillator will change the switch oscillator fundamental frequency which will activate the switch. The object could be an inanimate object such as a stick and there is no need for the object to be conductive. The object could be a hand of the user. Proximity of any object to the switch oscillator will cause stray capacitance in the oscillator and hence change the oscillator characteristics and operating frequency.

The switch can operate as a conventional on/off switch, or dimmer switch or provide other programmable functions without the need for a physical connection to the electric circuit located within the switch, thereby removing the risk of electric shock and allowing the switch to be used in locations otherwise precluded to an AC switch.

Because the switching is non-mechanical, the possibility of the switch arcing is eliminated. That renders the switch safe for use in areas of explosion hazard, for example petrol station forecourts, and places where flammable gas is used or stored.

Preferably, the components of the switching device are arranged on a printed circuit board.

In another embodiment several such switching devices may be arranged on a single circuit board adjacent a single face plate. In such a case the face plate may have markings thereon to illustrate where a user should touch the face plate in order to activate particular individual switching devices.

In one embodiment the switching device can be used to switch a light circuit. In such a case various control functions can be effected by means of the switch controlled by software in the light circuit. For example, gradual ramping up of current to the light to preserve bulb life, a dimmer facility, random light switching or timed light switching can also be provided. In addition, a comfort lamp function where the light is progressively dimmed to a nursery light level may be provided. Also timed gradual lighting up may be provided to act as an alarm to wake the user.

In a further embodiment, where the switch is connected to the light circuit, the switch includes an integrated smoke detector system which is electronically integrated with the light circuit corresponding to the switch. The smoke detector system comprises a smoke detector element and a sounder which are located within the

retrofitting of the system since there is no need for an expensive mains control processor. In a most preferred embodiment a switch having all of the features of the first, second and third aspects of the invention is provided.

In a preferred embodiment of any of the above aspects the switch may be connected to a pad capable of vibrating on application of electrical power. In that way, a hard of hearing user may be alerted to, for example, a fire in the house. The user may place the pad under their pillow at night or on a chair during the day. The vibration of the pad acts as a warning to the hard of hearing user. Alternatively, or in addition to the pad, each switch may be arranged to strobe lights in a room or to sound an integral buzzer.

Another alternative embodiment of switch includes a microphone arranged to receive sound from the room in which it is located. In that embodiment the signal received by the microphone may be transmitted via the mains cable to another light switch on the circuit. The signal can be played through a speaker on the other switch. In that way, a nursery intercom system may be provided. In a preferred embodiment the control unit in the switch may alter the light settings according to the sound level in the room. Thus, the light may be arranged to dim gradually to a gentle glow but to ramp up gradually in response to increased noise level, such as a baby crying. Instead of the actual sound from the room being played through the other switch, a noise level indicator may be provided, such as a series of LED's which are progressively

The switch preferably comprises a microprocessor controller located within the, and attached to, the buildings mains wiring system. The microprocessor awaits one or more signal from the smoke detector system or PIR sensor to alert it to an alarm function. The microprocessor then operates, as well as the sounders and light circuits, functions such as the activation of a digital communicator or auto dialler to alert a central monitoring station or a designated key holder. The microprocessor may also operate a monitoring and control panel that indicates the type and source of any activation of any of the switches. The switches can, through the microprocessor, contact by telephone or other electronic means the controller and order it to activate any programmable functions which are attached.

A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawing, in which:

Fig. 1 shows a schematic circuit diagram of a contactless switch in accordance with the first aspect of invention, and

Fig.2 shows a more detailed schematic of the switch of Fig.1; and

Fig.3 shows a schematic diagram of a series of switches in accordance with the first, second and third aspects of the invention.

(PCB) 30 and, in particular, the switch sensing oscillator 18. The face plate 16 is designed to fit pre-existing switch mountings.

The switch sensing oscillator 18 is an oscillator of known type, which comprises a resistive component 36 connected to a sensing plate 38. The oscillator 18 has a fundamental frequency determined by its components. The sensing plate 38 comprises one capacitor plate connected electrically to the resistive component 36. The plate 38 is mounted to the rear surface 34 of the face plate 16. The face plate 16 acts as the dielectric for the sensing plate 38. Consequently, the sensing plate 38 acts as a capacitor which allows the oscillator to generate an output signal at a predetermined frequency. The sensing plate 38 is connected to the rear of the faceplate 16 such that it cannot be contacted by an operator approaching the front surface 32.

In use, the operator of the switch places his hand adjacent the front surface 34 of the face plate 16. The hand of the operator acts as the second plate of the capacitor, the sensing plate 38 acting as the first plate. Consequently, the capacitance of the sensing plate 38/face plate 16 arrangement is changed significantly by the presence of the hand of the operator. That, in turn, alters the frequency of the output signal of the oscillator 18.

A feedback circuit 48 is connected to a voltage generation circuit 22, which provides sufficient power to operate the circuit in the sensor part 12 and switch part 14 while the contactless switch is switched on or off.

Changes in the environmental conditions (i.e. a change in the temperature and/or pressure) can cause a change in the fundamental frequency of the switch-sensing oscillator 18. The software in the micro controller 20 recalculates the fundamental frequency of the switch oscillator 18 every fixed interval and therefore the switch re-calibrates itself to reduce drift within the oscillator circuit 18. When the contactless switch is first connected to the mains supply the software within the micro controller 20 calculates the frequency of the alternating voltage that it is connected to. This allows the switch to be used in countries that have differing AC frequencies (i.e. 50Hz or 60Hz).

The external circuit 29 may be a mains light circuit.

The feedback circuit 48 is connected, for example via a capacitor (not shown), to the sensor part 12 and provides sufficient power to operate circuitry in the sensor part 12.

A further embodiment of the design includes a safety circuit which prevents an electric shock to a person replacing a lamp or touching the two conducting prongs within the lamp holder.

With the inclusion of software-controlled micro circuitry further control functions are incorporated. For example, when the external circuit is a light circuit, a tungsten lamp life extender, auto or resettable lamp brightness control, auto lamp turn off after pre-set time expires, random light turn on/off, slow fadeout control for childrens bedrooms function are incorporated.

When the external circuit 29 is a light circuit and the light itself is a tungsten lamp, the control circuit will gradually increase the voltage supplied to the lamp. In that way, cold inrush current is reduced and early burn-out of the lamp is prevented.

A dimmer is provided to enable control of the intensity of the lamp. By maintaining the hand over the plate 16 for a predetermined period, a dimmer mode is activated. Maintaining the hand in place results in successive dimming of the lamp. The hand can then be removed from the switch when the desired lamp intensity is reached.

All of the above functions are programmed by the user touching the face plate and the various control options are presented sequentially. Alternatively, the face plate 16 may include a dial to cycle through control options or an LCD display which indicates which function/functions are active and allows selection of such functions from a displayed list.

A plurality of light switches 10 as described above may be incorporated into a mains light circuit system 50 as shown in Fig.3.

In Fig.3 four light switches 10 are shown as part of a mains light circuit system 50.

Each switch 10 comprises a switch as described in Fig.1 which allows contactless switching of a light 52. Each switch 10 includes a microprocessor control 54 which incorporates the switching part 14 of the contactless switch 10 and which also provides control functions for the light circuit and other systems to be described below. Each switch 10 also incorporates a mains electricity cable signal transmitter/receiver 56 which allows signals 58 to be sent and received along a mains electricity cable 60 (shown in broken lines).

mains cable 60 to other such switches 10 in the mains light circuit system 50. On receipt of an alert signal indicating smoke detection in a room the respective microprocessor controls 54 of the other switches 10 cause the sounder of the smoke detector system 62 to sound and strobe the lights 52 in the respective rooms. The light 52 in the smoke affected area may remain fully on. Alternatively, the light in the room which is affected by smoke may strobe and the other lights may simply be raised to full light levels to illuminate the area. Another function that is envisaged is that selective areas may be illuminated in order to indicate the direction of an escape route to the occupants of the building while lights in the affected room will continue to strobe so that emergency services can quickly locate the affected areas. In a most preferred embodiment the microprocessor control 54 can forward a signal to telephone apparatus to send an automatic emergency signal to the emergency services indicating the nature and location of the emergency.

The microphone 64 in the left-hand most switch 10 in Fig.3 will act as a nursery monitoring system. The switch 10 is installed in the nursery and the microphone will monitor the level of sound in the nursery. Should the level of sound exceed a predetermined level then an alert signal 58 can be sent via mains cable 60 to other light switches 10 on the circuit system 50 and those light switches can be arranged to sound a warning to occupants of the rooms to alert parents to a distressed child. In addition, where the light switch 10 incorporates a series of coloured LED's the LED'S can be illuminated in sequence indicating increased noise levels in the

Each switch 10 in the system described acts as its own master. Consequently, there is no need to incorporate a separate communication system which could be by-passed by an intruder. In order to circumvent the present system, every light switch must be destroyed or deactivated in some way or the mains cabling must be cut which is not practicable. The other advantage of the present system is its retrofittability. In particular, as each switch acts as a master individual switches or pairs of switches can be purchased and the system can gradually be built up into a fully integrated system. For example, the user may primarily be interested in the nursery facility so he/she may wish to purchase the microphone equipped switch for the nursery and another switch, for example, a lounge room. Where a hard-of-hearing person is interested in a smoke detector alert they may purchase a switch equipped with a vibration pad and one or more switches for installation in areas which present a fire hazard. Purchase of further switches will not affect the systems operation since each switch acts as a master and simply forwards appropriate alert signals along the mains cable and the alert signals are interpreted on receipt by the microprocessor control of the local switch.

Each microprocessor 54 controller can also operate other functions such as the activation of a digital communicator or autodialler alerting a central monitoring station or a designated keyholder, the operation of internal and external sounders and external security lights or strobe systems. The microprocessor controller may also operate a

obtrusive than conventional switches/dials and the absence of protrusions makes it much safer than the conventional dash board in the event of a crash.

In this application, the contactless switch 10 would be normally fitted with bi-coloured l.e.d. indicators and/or an array showing the switch status, i.e. either on or off or made selected, this also would aid finding the switch at low ambient light levels.

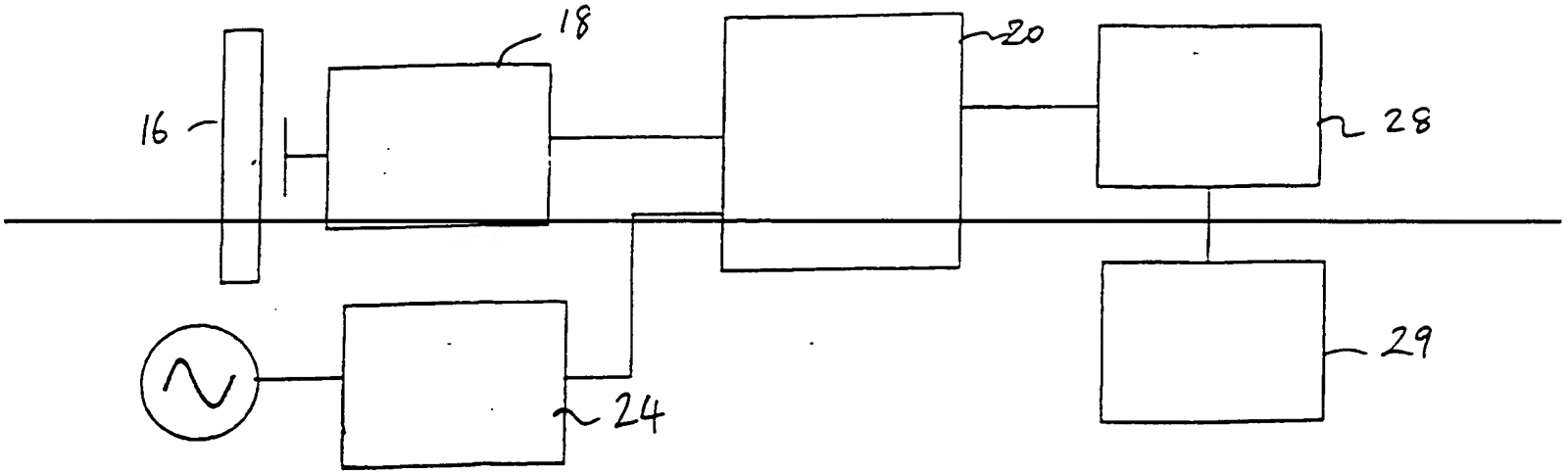
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FIG. 1

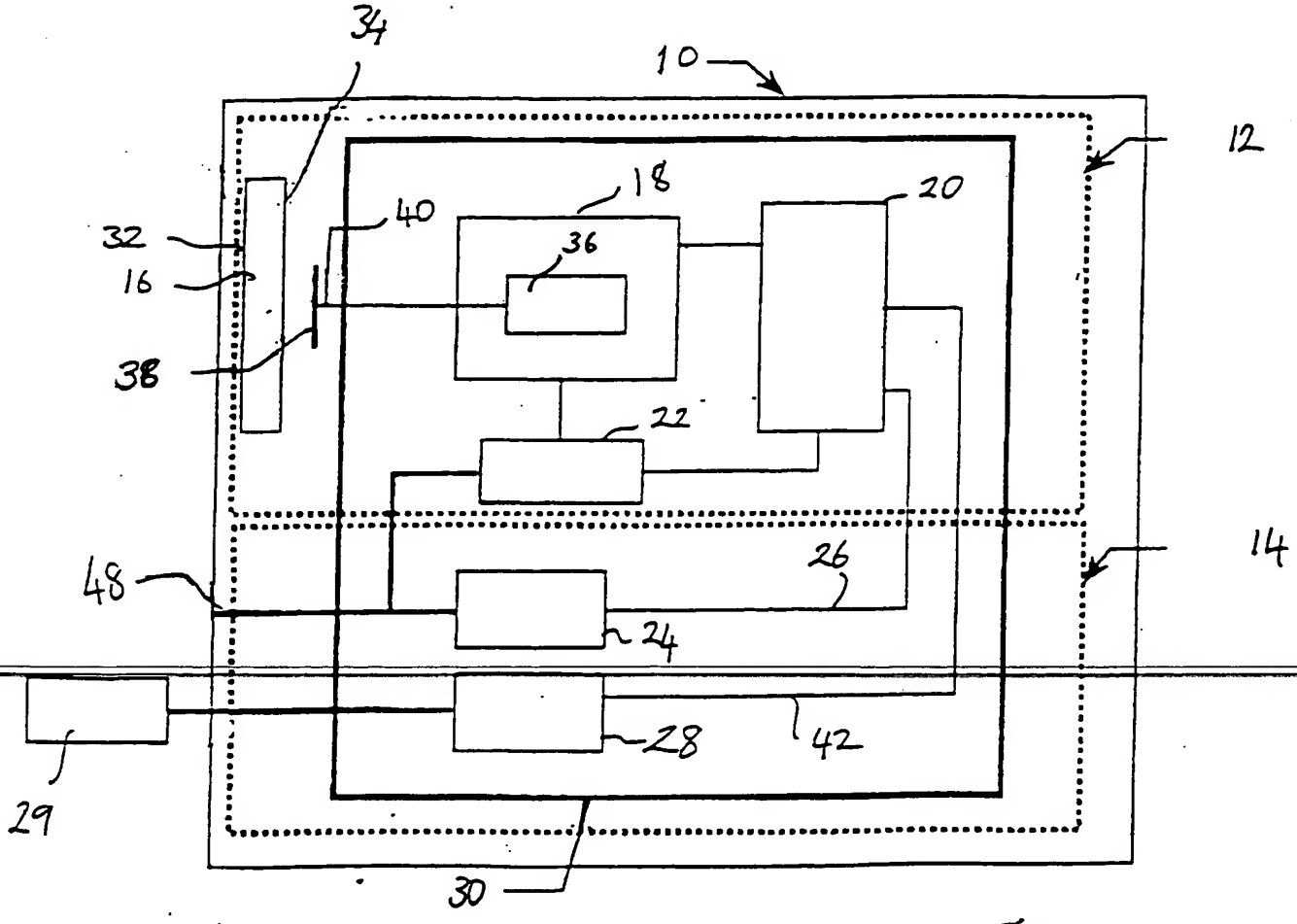
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FIG. 2

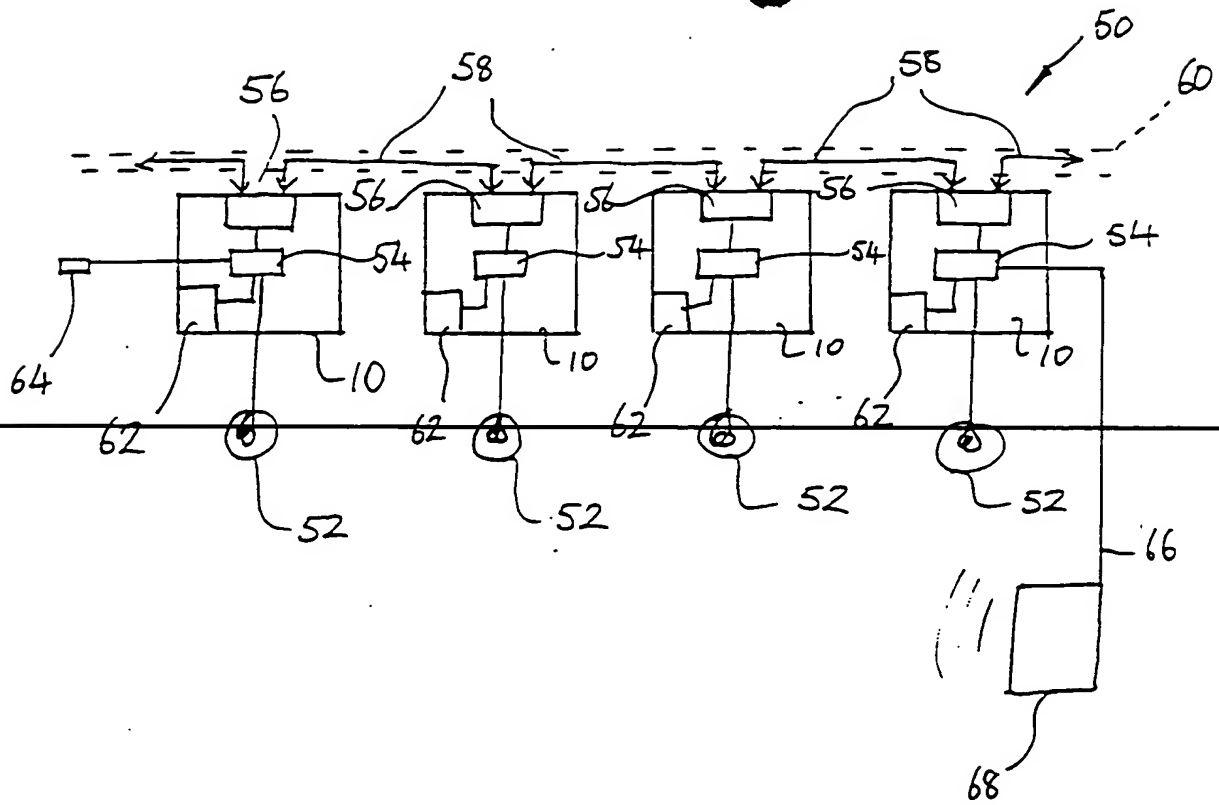
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FIG. 3